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A COMPARATIVE ANALYSIS OF DIRECT DEMOCRACY, TWO CANDIDATE ELECTIONS, AND THREE CANDIDATE ELECTIONS IN AN EXPERIMENTAL ENVIRONMENT

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ABSTRACT

This study explores the behavioral properties of two-candidate elections, three-candidate elections and large committees. The political processes were created under laboratory conditions that hold constant variables other than the decision rule. The core/equilibrium of a spatial model of competition is an accurate predictor of outcomes but the outcome variance is higher under three-candidate processes than it is under the other two. A poll tax is also studied.

A COMPARATIVE ANALYSIS OF DIRECT DEMOCRACY, TWO CANDIDATE ELECTIONS, AND THREE CANDIDATE ELECTIONS IN AN EXPERIMENTAL ENVIRONMENT*

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This study explores the behavioral properties of very simple political processes. The processes are two-candidate elections, three-candidate elections, and large committees. These alternative political processes are implemented under laboratory experimental conditions in which the issues and underlying population preferences over issues are held constant. Such a setting provides a method for checking the accuracy of spatial models of candidate competition. Indeed, if the models are sufficiently inaccurate in simple laboratory environments, then they might readily be rejected as applicable to much more complicated, naturally occurring systems. In addition, the experimental design provides a comparison of selected aspects of behavior of these alternative processes. The design can also be viewed as an extension of the experimental research reported in Fiorina and Plott (1978) and Plott and Levine (1978) that develops conditions under which the decisions that operate under majority rule can be accurately predicted by equilibrium models of political behavior. In the design reported here the conditions are relaxed by enlarging

considerably the size of the decisionmaking group.

The study is divided into four sections plus concluding remarks. Section One outlines the research questions. The procedures and parameters are in Section Two. Section Three contains the experimental results. Section Four discusses the results of an auxiliary experiment designed to examine the decision to vote. The paper contains no extensive discussion about the problems and limitations of experimental methods themselves even though the experiments here are the first laboratory examination of election process and many scholars harbor legitimate reservations about what might be learned from such an exercise. The methodological issues are addressed extensively in Fiorina and Plott (1978), and Plott (1978, 1981), so the interested reader is referred to those sources. Obviously political scientists have been interested in processes infinitely more complicated than those studied here and even within the context of these simple experiments a variety of complicating factors, alternative procedures, or alternative parameters could have been imposed. Presumably, these alternatives will be explored as experimental technology and experience is acquired.

SECTION ONE: RESEARCH QUESTIONS STUDIED

The groups studied are characterized by three prominent features.

a. The options available to the group are well specified and involve no uncertainty. This removes from consideration groups which traditionally have been called "problem solving" groups.

b. Individuals have "strong" incentives. There is no large-scale "indifference" among decisionmakers.

c. There are no premeeting meetings or agreements. Thus, the individuals meet to decide the issues without preformed coalitions.

When such groups operate using majority rule and a fixed agenda, the form of the agenda essentially determines the outcome (Plott and Levine 1978). When the agenda is not fixed but is determined endogenously as the group uses majority rule and common parliamentary procedures, small group decisions can be modeled as a cooperative game without side payments. By treating the majority preference relation as a dominance relation and computing the associated core, one obtains an accurate prediction of the group's choice (Fiorina and Plott 1978). This study was designed to answer three questions which naturally emerge from such results.

1. Does the core predict the outcome when the group (committee) is "large"? Several lines of reasoning can lead one to a negative prediction. In a large group an individual feels less influential and is thus likely to accept poor terms more readily. Thus according to this argument the outcomes would be more erratic as the group size increases and individuals readily accept the first options they are offered. In addition, the potential for leadership influence and the related conformity tendencies of followers would increase the likelihood of coalition formation. A coalition, once formed, would not likely choose the core.

2. Does the group choice diverge from the equilibrium/core when the decision is made by means of a majority-rule two-candidate election process? Is there a difference between the policy-choice behavior of a large committee and procedures when the winner of a competitive election chooses the policy? Spatial models of candidate competition (see Riker and Ordeshook, 1973, for a summary) suggest that the model used above to describe the choices of small committees applies equally well to the choice behavior of electorates choosing between two candidates. Data in support of such claims are sparse and alternative modes of thought lead readily to different conclusions. If, for example, candidates put together a coalition, or if individuals vote for personalities rather than preference, or if candidates become loyal to subsets of supporters and thereby fail to move too far from them, etc., etc., then the outcome will not be the core.
3. What are the differences between two-candidate election processes and three-candidate processes? Existing models apply only to the two-candidate case. The intuitive reasoning which underlies the two-candidate models suggests that three-candidate elections will behave substantially differently. Candidates who adopt the core position can be "squeezed out" by the other two candidates. Thus the core position might not tend to be chosen.

Existing models do not have an exceptionally strong base in the theories of individual choice and behavior. Many aspects of individual behavior stand as near paradoxes against the reasoning which lies behind the models. Existing theories are pushed hard to

explain why people vote (Ferejohn and Fiorina 1975). In three-candidate elections, how an individual votes is as perplexing as why (s)he votes. Furthermore, the optimum strategy for a candidate is not obvious so there is sufficient theoretical latitude to support almost any result. The experiments provide an opportunity for us to study the behavior of some simple cases of these processes.

SECTION TWO: PROCEDURES AND PARAMETERS

Subjects were recruited from California Institute of Technology, Pasadena City College, Los Angeles City College, University of California, Cal State Los Angeles, Cal State Fullerton, and Cal State Northridge. Large classes were used where possible; otherwise subjects were recruited and paid $4 (which was promised them) plus whatever they earned during the experiment as dictated by their payoff chart explained below. All payments were made in cash immediately after the experiment.

The procedures are essentially those reported in detail in Fiorina and Plott (1978). The "issue space" was the blackboard. A preference for each individual was induced on the basis of the theory of induced preference (Smith 1976). That is, where the blackboard was given a coordinate system, each individual i was assigned a function $u^i(x,y)$ indicating the amount of money he would receive from the experimenter expressed as a function of the point chosen by the group. Since no side payments were allowed, this function induced preferences for points on the blackboard according to $(x,y)R^i(x',y') \Leftrightarrow u^i(x,y) \geq u^i(x',y')$. The gradients of the functions $u^i(x,y)$ were generally between $1 and $3 per unit over relevant ranges of the blackboard.

A typical payoff chart is included here as figure 1. In the election experiment the winning candidate was paid $10 and the losing candidate was paid $1.

The indifference curves of each individual were circles centered around his/her most preferred point. The distribution of most preferred points for thirty-five subject experiments is shown on figure 2. Because recruitment was difficult, frequently the number of subjects differed across experimental sessions. The formula for adding or subtracting subjects from the standard thirty-five person design shown on figure 2 is outlined on table 1. For sessions with fewer than thirty-five subjects, locations were removed in pairs starting with the locations indexed as first which are the preferences of individuals 32 and 33. The second pair removed was individuals 28 and 29, etc. When more than thirty-five participants were available, subjects were added by giving pairs preferences in the same order as just described. Thus, individuals 36 and 37 had the same preferences as individuals 32 and 33, etc.

The distribution of ideal points (figure 2) satisfies a condition of radial symmetry around the point (40,70) for all experiments. For each individual there is another individual whose most preferred point is on the "opposite side" of (40,70). This condition was shown by Plott (1967) to constitute a sufficient condition for (40,70) to be a core/equilibrium. Notice, however, that (40,70) is not the mean of the distribution of ideal points nor is the point (40,70) near the middle of the range of the distribution of ideal points. So, theories based on such properties of the distribution cannot be used as alternative explanations of outcomes.

FIGURE 1 : Example Payoff Chart

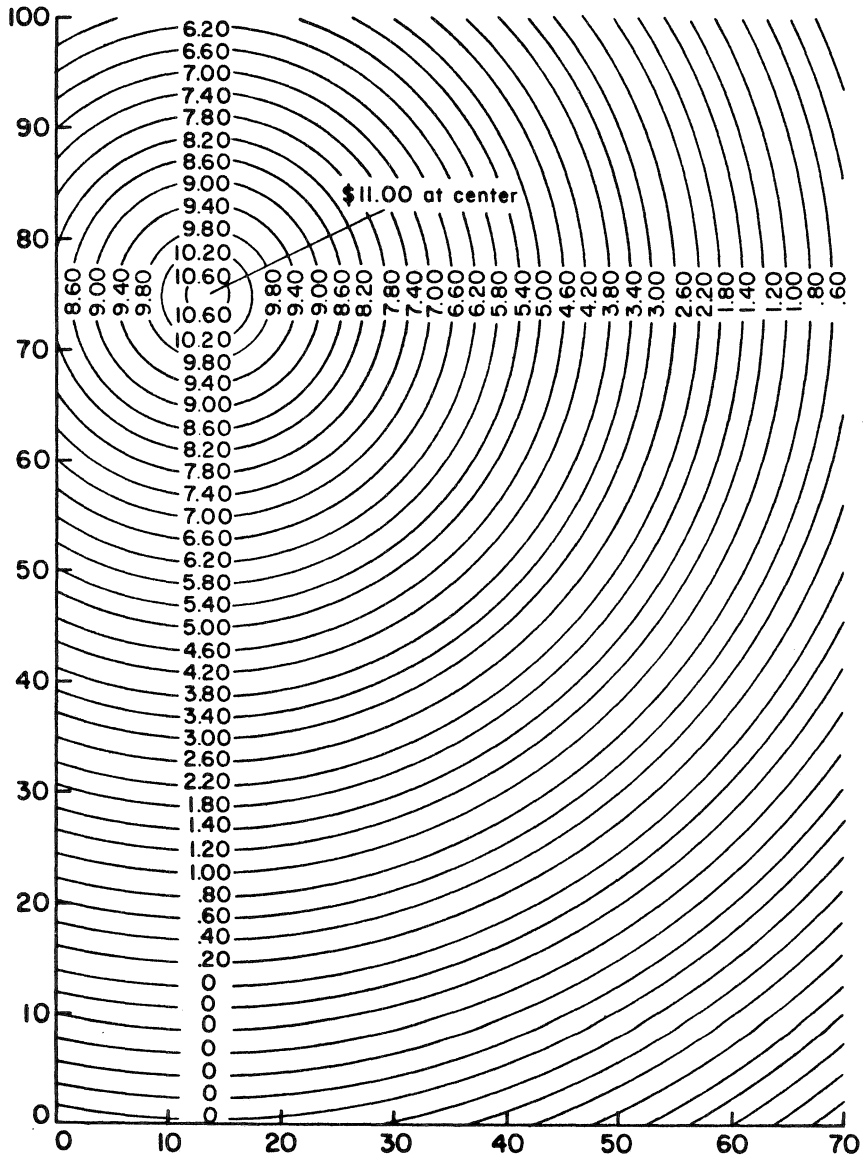


FIGURE 2 : Distribution of Individual Optimums

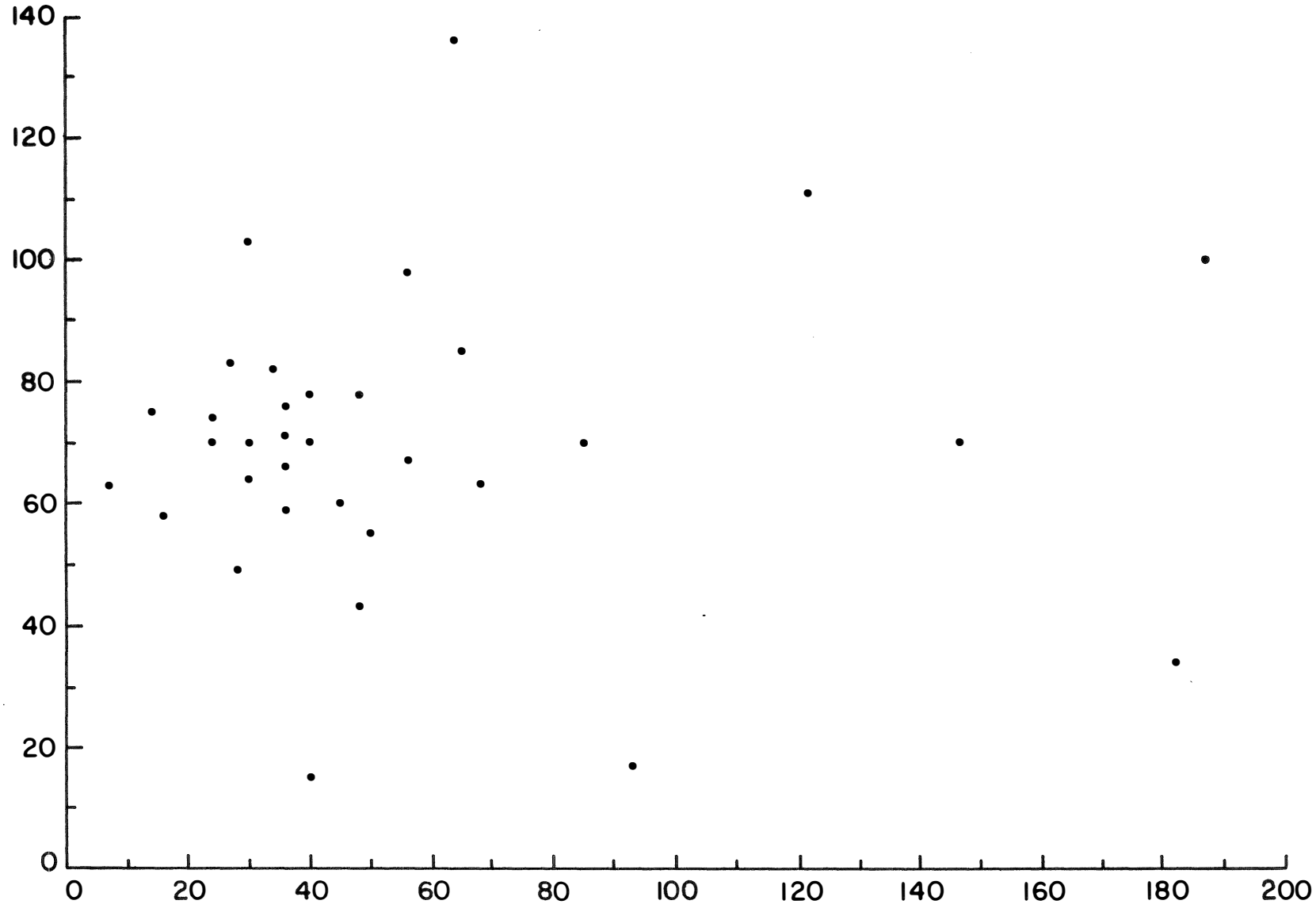


TABLE 1

REMOVAL SEQUENCE[3]

Subject Number	Maximum Point	Position in Removal Sequence	Subject Number	Maximum Point	Position in Removal Sequence
1	(40,70)		19	(147,70)	
2	(24,70)	8th	20	(30,64)	3rd
3	(85,70)	8th	21	(65,85)	3rd
4	(24,74)		22	(36,59)	5th
5	(182,34)		23	(64,136)	5th
6	(27,83)	7th	24	(36,76)	9th
7	(93,17)	7th	25	(50,55)	9th
8	(28,49)		26	(36,71)	12th
9	(56,98)		27	(68,63)	12th
10	(48,43)	10th	28	(36,66)	2nd
11	(30,103)	10th	29	(48,78)	2nd
12	(16,58)		30	(14,75)	6th
13	(122,111)		31	(56,67)	6th
14	(7,63)		32	(34,82)	1st
15	(187,100)		33	(45,60)	1st
16	(40,15)	11th	34	(40,70)	4th[1]
17	(40,78)	11th	35	(40,70)	4th[2]
18	(30,70)				

1 This position is never removed in the three-candidate election.

2 This position is always removed from all three-candidate elections.

3 For experiment with more than thirty-five in the electorate, positions were added in the same order as the removal sequence.

After subjects were seated, volunteers were recruited for the position of candidate in the election experiments. The instructions (see the appendix) explained how to read their payoff charts and the procedures. In all experiments, no individual had information about payoffs of others and individuals were not allowed to indicate the amounts or make side payments even though statements about preferences were admissible.[1]

The dynamics of all three types of processes can be identified by a series of periods which are more precisely defined in the election processes. For the large committee experiments the process started with a motion on the floor (200,150). This motion could be amended, with the amended motion becoming the new motion on the floor, until the question was called and a majority accepted the motion as amended. Each successful amendment can be viewed as a stage since the effect was to change the motion on the floor from one point to another.

The election processes began with all candidates at the same point (200,150). Candidates were free to change their positions at any time. The group choice was the position of the winning candidate at the time of the election. A period could be identified with the opportunity for a candidate to gain information about preferences by asking polling questions: "How many would like for me to move to point _____?" Such opportunities were given to candidates in turn and the answers obtained were public information. Every several minutes a Gallup poll was taken ("If the election were held now, how many would vote for _____?"). The results of these polls were public.

SECTION THREE: EXPERIMENTAL RESULTS--OUTCOMES

For all experimental sessions the core is the point (40,70). Ten experimental sessions were conducted for each of the three processes. As can be seen on figures 3 and 4 as well as table 2 the core is an excellent predictor for all three processes. The mean outcomes are (38.3,69.8), (38.8,70.9), and (39.2,70.5) respectively for direct democracy, two-candidate elections, and three-candidate elections. Standard deviations for the committee and two-candidates are small and about one-third of the standard deviation of the three-candidate election.

The central results are thus easy to state. The mean outcome from all three processes is essentially the same. On average all three processes tend to produce core/equilibrium outcomes.[2] The variances of direct democracy and two-candidate elections are approximately equal but the variance of the three-candidate process around this mean is higher than the other two.[3]

From an anecdotal or "qualitative" point of view, the large committees do seem to be different from small committees. The small groups we have observed (Fiorina and Plott 1978) are interactive. Large groups are not. Only a small subset seems to participate at all and the meetings seem to go much faster. People simply voted their interest without bothering to argue, compromise, or persuade others. This supports a conjecture that large groups will be much more susceptible to procedural influences such as those reported in Plott and Levine (1978) than are small groups.

The experimental outcomes for the two-candidate elections

leave little room for debate. The candidates tend to converge together and to the generalized median, core, or equilibrium (depending upon how you derived the point). Clearly, for this class of institutions and situations, the principles which underlie the spatial models of candidate competition stemming from the work of Downs (1957) are correct.

Again, generalization from personal observations leads to some interesting speculations. Candidates' behavior is very sensitive to the information they receive from the electorate. Candidates tend to change their position primarily in response to Gallup polls which show they are behind. They gather information about preferences on issues from every opinion poll available but tend not to act on the information unless they are behind as revealed in the Gallup poll.

In eight of the experiments in which proper records exist on the details of candidate movement, candidates made a total of fifty-eight moves. Of these, forty moves or 69 percent of the total were made by the candidate who was losing in the previous Gallup poll. (The null hypothesis that movement by winners and losers is equally likely can be rejected at the .01 level of significance.) When forced to move, they then seem to follow a type of gradient procedure whereby they simply go in the direction which would yield the most votes.

The distance candidates move tends to be much greater than the steps taken in large committees. This suggests that the information revealed by the polling techniques in this experiment does not allow the candidates to adjust themselves as finely to individual preferences

FIGURE 3 : Large Committee Outcome Distribution

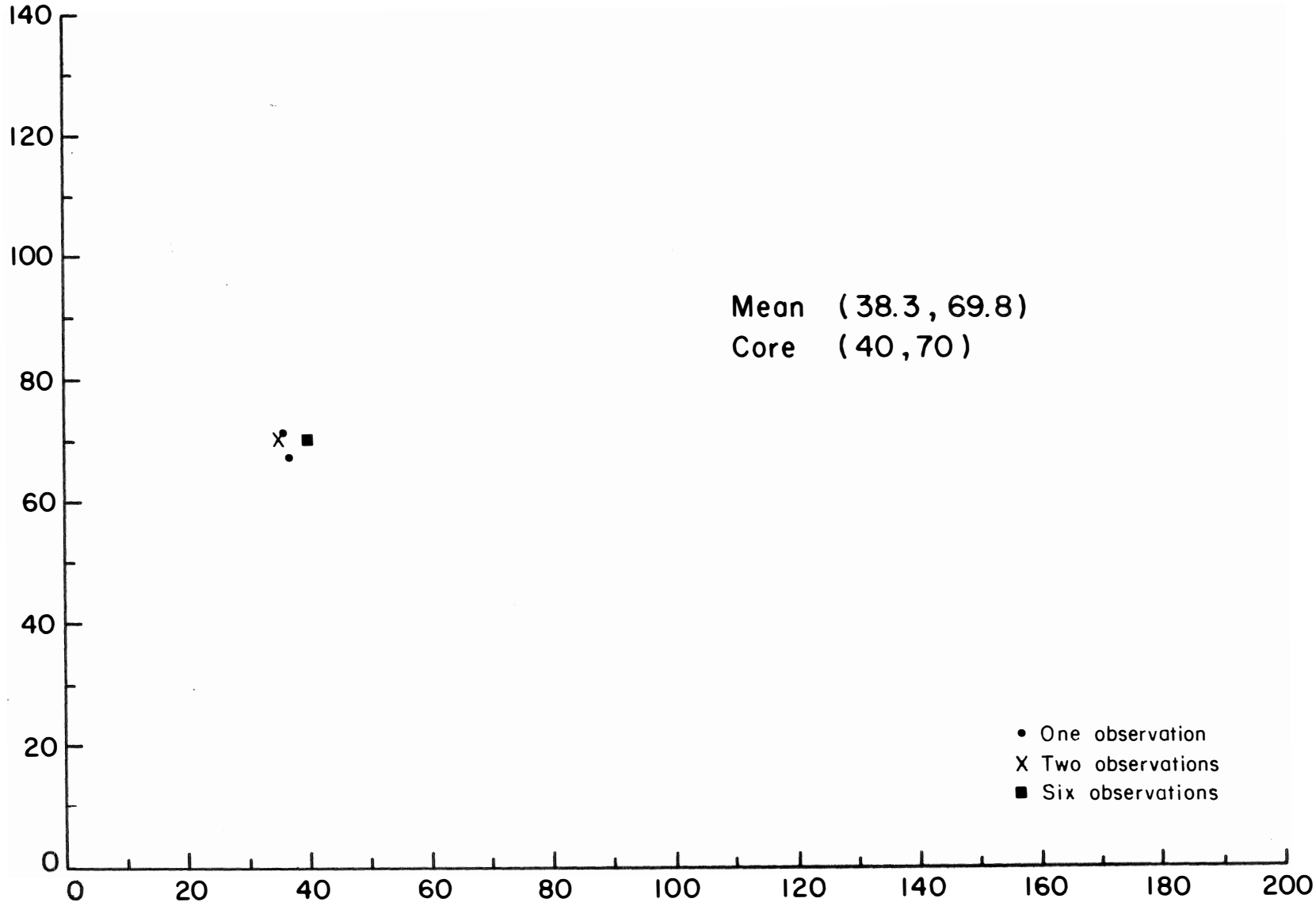


FIGURE 4 : Two-Candidate Elections Outcome Distribution

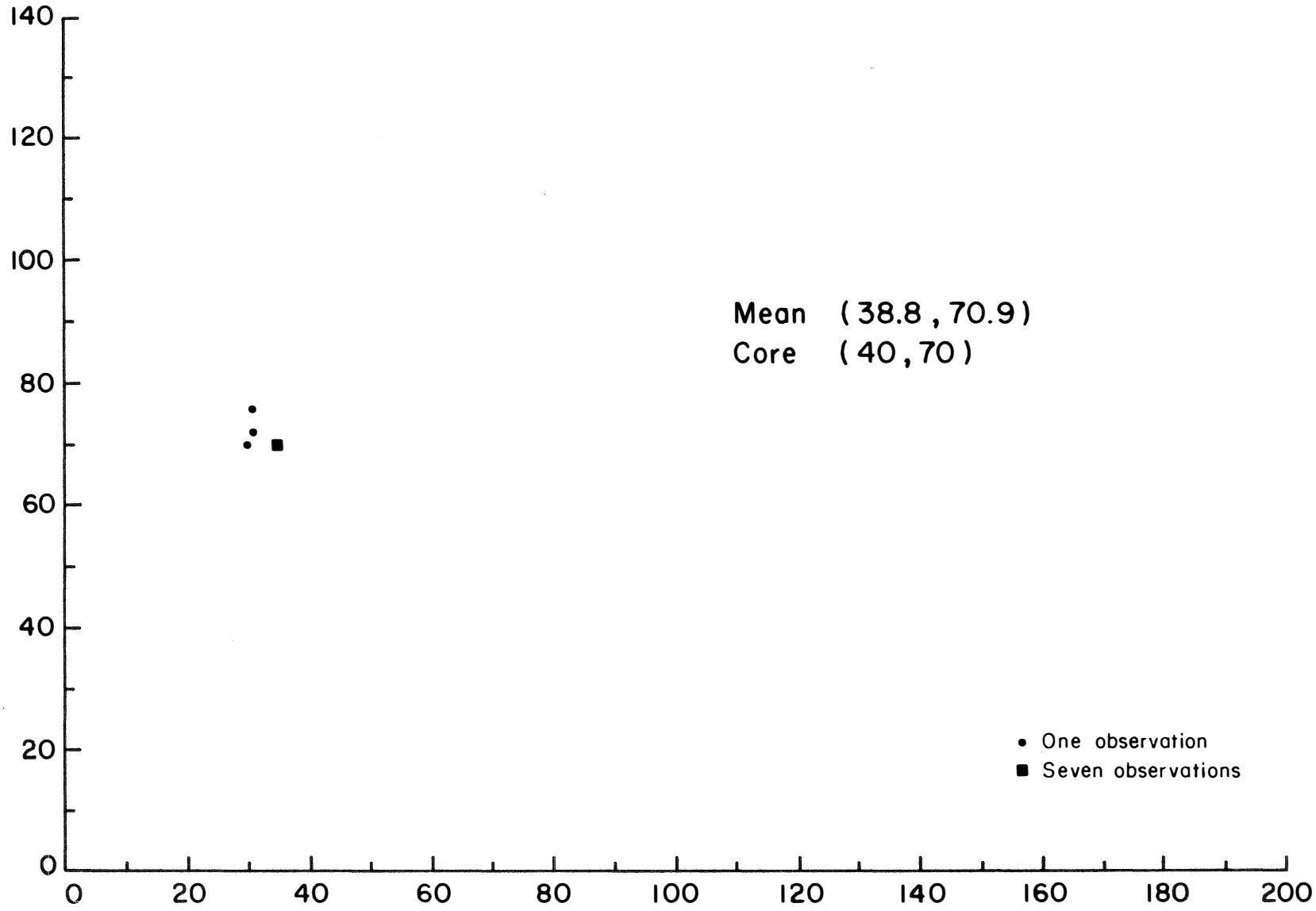


TABLE 2

INDIVIDUAL EXPERIMENT DATA

Committees			Two-Candidate Elections					Three-Candidate Elections						
Exp. No.	No. of Subjects	Final Choice	Exp. No.	No. of Subjects (excl. cand.)	Candidate Final Points S	T	Votes S	T	Exp. No.	No. of Subjects (excl. cand.)	Candidate Final Points S	T	U	Votes S	T	U
101	35	(40,70)	203	23	(38,72)	(40,70)	12	13	301	22	(53,70)	(36,70)	(34,70)	10	7	8
102	35	(37,67)	204	41	(45,60)	(40,70)	9	33	302	22	(21,65)	(75,75)	(60,40)	12	8	5
103	23	(35,70)	205	33	(40,63)	(40,70)	16	19	303	28	(40,69)	(40,70)	(41,69)	8	13	10
104	27	(35,70)	206	19	(45,75)	(40,70)	8	13	304	22	(40,70)	(35,70)	(45,70)	13	5	7
106	35	(40,70)	207	23	(35,75)	(36,76)	10	15	305	30	(38,70)	(40,70)	(45,75)	12	7	13
107	45	(36,71)	208	19	(35,70)	(42,65)	15	6	306	26	(40,70)	(40,71)	(41,68)	8	8	13
108	23	(40,70)	209	19	(50,60)	(40,70)	9	12	307	48	(42,72)	(45,70)	(42,72)	5	18	27
109	35	(40,70)	210	27	(37,73)	(36,72)	15	14	*308	28	(35,70)	(55,65)	(45,60)	15	10	5
110	31	(40,70)	211	35	(40,70)	(35,70)	15	14	309	24	(30,75)	(35,70)	(60,65)	2	12	11
111	33	(40,70)	212	41	(39,70)	(40,70)	18	23	310	24	(31,75)	(40,70)	(35,75)	10	13	4
									311	33	(60,80)	(40,70)	(35,75)	12	3	18

*Due to an administrative error charts were not distributed in accord with Table 1. The core of this game is (40,70) but no subject had a maximum at that point. The observation is eliminated from all calculations below.

Outcome mean	(38.3,69.8)	(38.8,70.9)	(39.2,70.5)
$\left[\sum_i \frac{\|(x_1^i, x_2^i)-(40,70)\|^2}{10}\right]^{1/2}$	(2.92)	(3.08)	(8.32)

as might otherwise be the case and that in situations where decision costs are low, direct democracy might adjust "more closely" to preferences than do competitive election processes. A reasonable conjecture is for example that, had the equilibrium not been in multiples of five or ten, say at (36,73), the elections would have still gone to (40,70) while the direct democracy would have gone to (36,73). Of course, if the process is costly in terms of polls or in terms of a personal cost to those who propose amendments, the comparative performance might be very different indeed.

The fact that candidates in these processes have no personal preferences over issues leads to another interesting variable. If, for example, a candidate has his/her own independent preferences over issues, (s)he may be willing to risk losing the election for the additional reward he would gain if when elected (s)he is able to implement decisions that are to his/her personal liking. If candidates are allowed to have preferences in addition to winning, then the system may behave differently and be sensitive to the process of candidate selection.

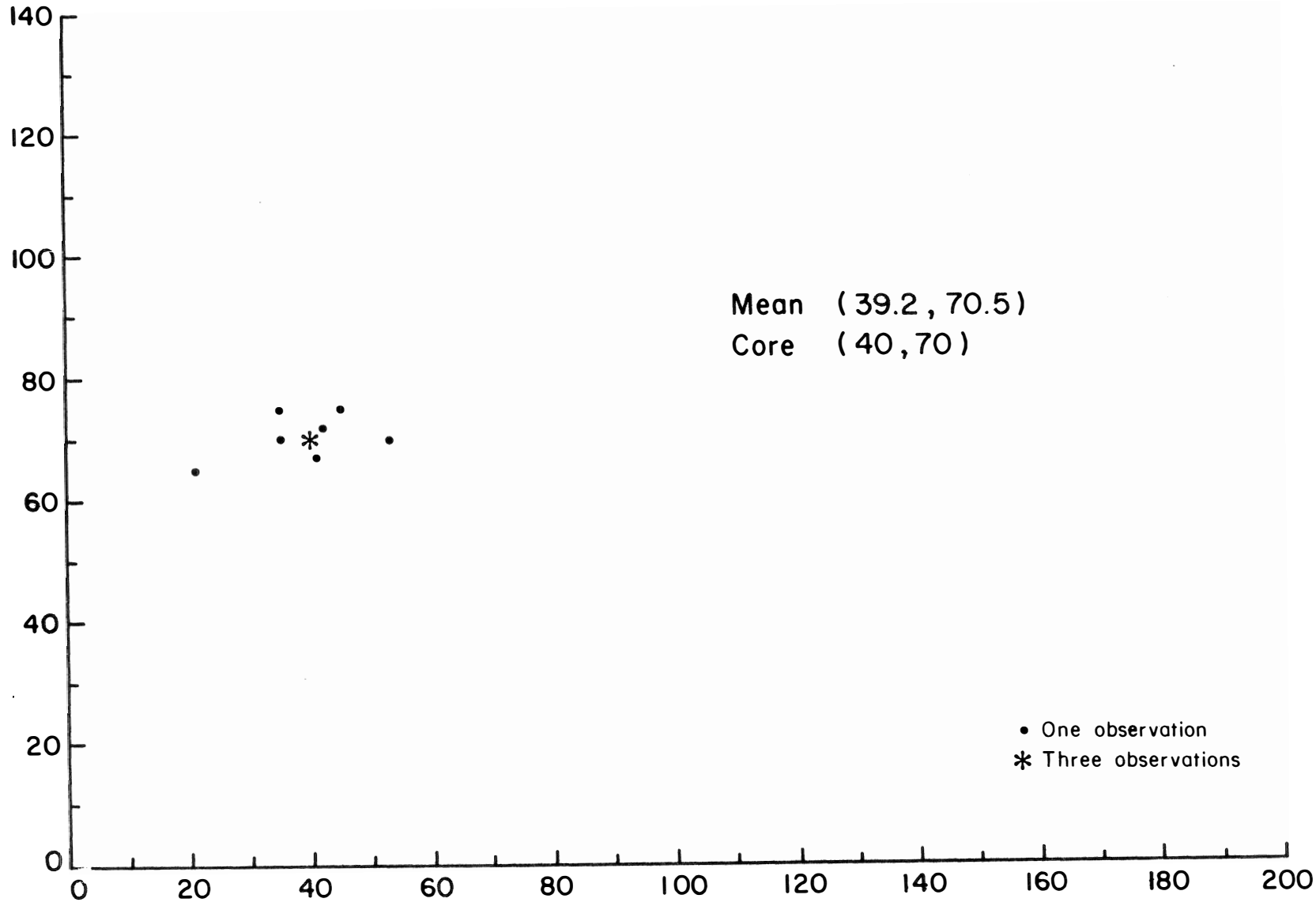
Other institutions such as polling techniques appear to be exceptionally important. In these experiments, candidates basically asked "how many would prefer me to move to ____ ?" although other questions were asked whenever candidates could find a way to articulate them (e.g., "How many are to the right of fifty on the x?" "How many want me to move up?" "How many would vote for me if I moved to ____ ?"). Preliminary experiments suggested that the system would not generally converge if candidates were not allowed to take opinion polls. That

is, if the candidate knows only whether he is ahead or behind and has no other information about where people's preferences lie, then the system may exhibit different behavior. Thus the results reported here are likely to be sensitive to institutional perturbations.

Outcomes of the three-candidate election are graphed on figure 5. Because of the lack of theory, generalizations are difficult to make. The pattern indicates that on average the process will result in the median but the variance is large. The following theory based on the dynamics of the behavior emerges. Candidate competition drives all candidates to the median. Once there, however, the "middleman" is squeezed out by the candidates on both sides of him. If the election is held when candidates are in this configuration, one of the "outliers" will win. If candidates still have the opportunity to change positions, the "middleman" will move away from the equilibrium, thereby initiating a new cycle converging toward the equilibrium. The distribution of outcomes seems to depend critically upon the timing of the election since that will determine the phase of the cycle on which the experiment is terminated.

There are observations, however, which cast doubts on this theory. Notice the position of candidates on table 2 for experiment number 304. Candidate S at (40,70) is boxed in on both sides by T on his left at (35,70) and U on his right at (45,70). If individuals had voted sincerely for the candidate whose position would yield the most money, the vote would have been five for S, ten for T, and ten for U. Candidate S won because he got five votes which T would have gotten by sincere voting and three

FIGURE 5 : Three-Candidate Elections Outcome Distribution



votes which U would have gotten, thereby bringing his vote to thirteen. Comments volunteered by subjects afterward supported the hypothesis that voters were consciously using strategic voting strategies. Some voters who preferred an outlying candidate decided to vote for the person in the center because their favorite candidate had not been doing well at the polls and the voters did not want to "waste" the vote. They therefore shifted support to the median. If such strategic voting is generally characteristic of three-candidate processes, the instability discussed above should not occur. Here we definitely need more theory and that theory should incorporate the probability of winning as perceived by the voter.

SECTION FOUR: THE DECISION TO VOTE

For some of the two-candidate elections the experimental design had a feature not revealed in the instructions. After individuals had marked their ballots indicating for whom they were planning to vote, they were told there would be a poll tax. If an individual wanted his/her vote counted, a poll tax of $.50 would be deducted from earnings. Subjects were assured that they would be paid according to the position of the winning candidate independent of the decision to vote. The decision not to vote could only affect an individual's payment by influencing the outcome of the election. Those who wanted their vote counted and were willing to pay the $.50 were asked to place an X on their ballots. Actually the poll tax was not collected and all individuals' votes were counted in determining the winner.[4]

Figure 6 contains the frequency of decisions to vote as

a function of the monetary difference between the two candidates as seen from the subjects' point of view. While the observations are not as numerous as we would like, a pattern is definitely beginning to emerge. The relative frequency of voting clearly increases as the difference between the candidates increases. This can be seen impressionistically from the figure and from the logit model estimated and plotted in the figure against the data.

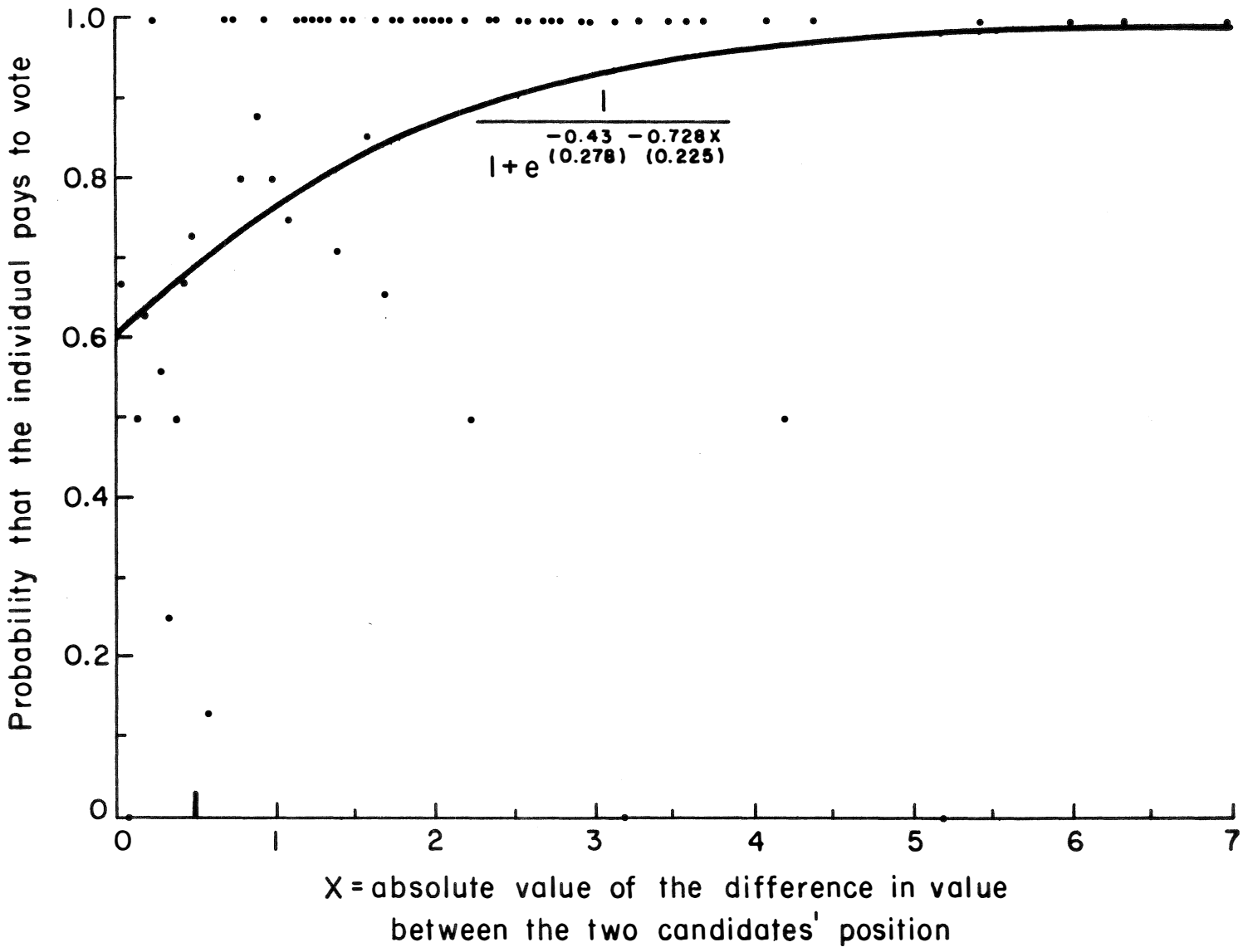
Of particular interest is the high frequency of voting which occurs when the difference between the candidates is less than $.50, the cost of voting. Sixty-three percent of these subjects for whom the difference between the candidates was $.50 or less paid $.50 to vote. These people voted even though the cost of voting exceeded or equaled the maximum possible monetary return from voting. Whether or not this behavior is a result of a feeling of "duty" has yet to be determined, but the data are very supportive of a model such as the one found in Riker and Ordeshook (1973).

SECTION FIVE: CONCLUDING REMARKS

The conclusions are easy to summarize. For the political situations studied here in which the citizens had well-formed preferences over an issue space characterized by certainty, and where there were no premeeting meetings, there was very little difference between the behavior of large committees and two-candidate electoral behavior. They all resulted at the core or equilibrium. The spatial models in these settings are very accurate predictors of policy. Three-candidate processes can produce different process behavior. The median of

FIGURE 6

DECISIONS TO PAY COST OF VOTING



individual preferences will emerge on average as the group choice but the variance is larger than for the other two processes. Thus in the three-candidate processes individuals who are "far" from the center are more likely to get favorable policies than is the case with two-candidate elections.

A satisfactory explanation of these results is not available. The exact process of convergence is possibly sensitive to the nature of the polling institutions and practices which provide candidates with feedback on their strategies. Candidate decisions are clearly influenced by the state of their current information. Research should not focus on the dynamic properties of candidate decisions alone, however, as is the natural tendency in game theoretic models. Voting patterns in three-candidate elections and in response to voting costs suggests there is much which remains to be explained even within political settings as simple as these.

General

You are about to participate in a committee process experiment in which one of numerous competing alternatives will be chosen by majority rule. The purpose of the experiment is to gain insight into certain features of complex political processes. The instructions are simple. If you follow them carefully and make good decisions, you might earn a considerable amount of money. You will be paid in cash.

Instructions to Committee Members

The alternatives are represented by points on the blackboard. The committee will adopt as the committee decision one and only one point. Your compensation depends on the particular point chosen by the committee (see attached payoff chart). For example, suppose your payoff chart is that given in Figure 1 and that the committee's final choice of alternative is the point (x,y) = (170,50).

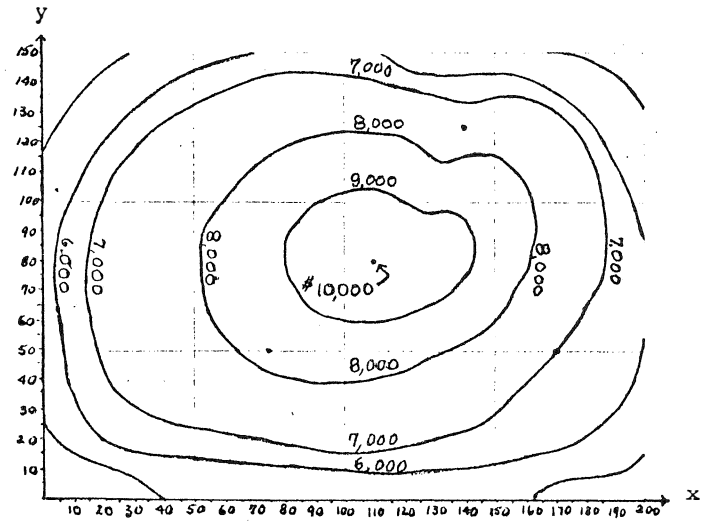


Figure 1

Your compensation in this event would be $7,000. If the policy of the committee is (140,125) your compensation would be computed as follows:

The point (140,125) is half-way between the curve marked $7,000 and the curve marked $8,000. So, your compensation is half-way between $7,000 and $8,000, i.e. $7,500. If the policy is one-quarter of the distance between two curves, then your payoff is determined by the same proportion (i.e. at (75,50) which is one-quarter of the way between $8,000 and $9,000, you get $8,250).

The competition charts may differ among individuals. This means that the patterns of preferences differ and the monetary amounts may not be comparable. The point which would result in the highest payoff to you may not result in the highest payoff to someone else. You should decide what decision you want the committee to make and do whatever you wish within the confines of the rules to get things to go your way. The experimenters, however, are not primarily concerned with whether or how you participate so long as you stay within the confines of the rules. Under no circumstances may you mention anything quantitative about your competition. You are free, if you wish, to indicate which ones you like best, etc., but you cannot mention anything about the actual monetary amounts. Under no circumstances may you mention anything about activities which might involve you and other committee members after the experiment (i.e. no deals to split up afterward or no physical threats).

Parliamentary Rules

The process begins with an existing motion (200,150) on the floor. You are free to propose amendments to this motion. Suppose,

for example, (170,50) is the motion on the floor and you want the group to consider the point (140,125). Simply raise your hands and when you are recognized by the chair, say "I move to amend the motion to (140, 125)." The group will then proceed to vote on the amendment. If the amendment passes by a majority vote, the point (140,125) is the new motion on the floor and is subject, itself, to amendments. If the amendment fails the motion (170,50) remains on the floor and is subject to further amendment. Thus, amendments simply change the motion on the floor. You may pass as many amendments as you wish.

At any time during the consideration of an amendment or the motion on the floor a motion to end debate is in order. If there are no objections, an immediate vote will take place. If there are objections, the motion to end debate will itself be put to a majority vote. If the motion to end debate fails, the amendment process continues. If it passes, a vote on the amendment or motion will take place.

To sum up, the existing motion on the floor is (200,150). You are free to amend this motion as you wish. The meeting will not end until a majority consents to end debate and accept some motion. Your compensation will be determined by the motion on the floor finally adopted by the majority.

Are there any questions?

We would like you to answer the questions on the attached page. These should help you understand the instructions.

INSTRUCTIONS FOR TWO-CANDIDATE ELECTIONS

General

You are about to participate in an electoral process experiment in which one of two candidates (S or T) will be elected. The purpose of the experiment is to gain insight into certain features of complex political processes. The instructions are simple. If you follow them carefully and make good decisions, you might earn a considerable amount of money. You will be paid in cash.

Instructions to Voters

Your task is to elect either candidate S or candidate T. The task of the elected individual is to choose one of several competing alternatives, represented by points on the blackboard. After the election he/she will choose one and only one point. Your payoff depends on the particular point chosen by the elected individual (see attached payment chart). For example, suppose your payment chart is that given in figure 1, and that the elected individual's choice is the point (x,y) = (170,50).

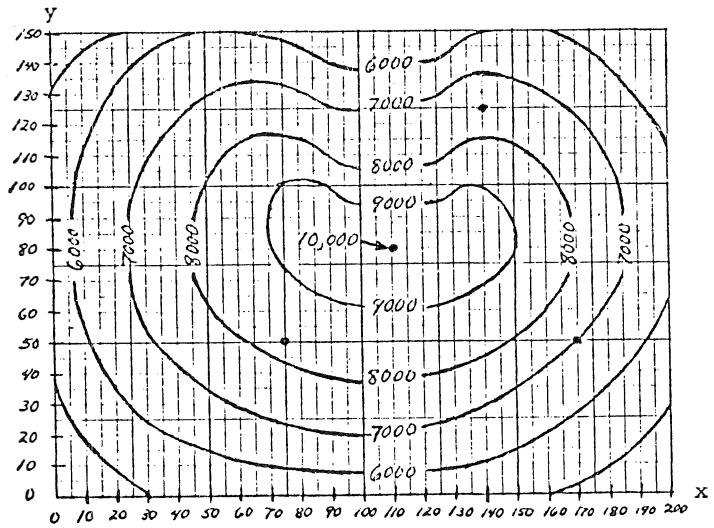


Figure 1

Your payment as read from figure 1 would be $7,000.

For points which lie between curves, the chart should be read in the following manner. Suppose the elected individual chooses the point (140,125). This point, (140,125), is half-way between the curve marked $7,000 and the curve marked $8,000. So your payment is half-way between $7,000 and $8,000, i.e. $7,500. If the point is one-quarter of the distance between two curves, then your payment is determined by the same proportion. As an example (75,50) lies one-fourth of the way between the curve marked $8,000 and the curve marked $9,000, so you get $8,250.

The payment charts may differ among individuals. This means that the patterns of preferences differ and the monetary amounts may not be comparable. The point which would result in the highest payment to you may not result in the highest payment to someone else. You should decide what final decision you want and do whatever you wish within the confines of the rules to get things to go your way. The experimenters, however, are not primarily concerned with whether or how you participate so long as you stay within the confines of the rules. Under no circumstances may you mention anything quantitative about your payment. You are free if you wish, to indicate which point you like best, the ones you like least, the direction of your preference, etc. but you cannot mention anything about the actual monetary amounts. Under no circumstances may you mention anything about activities which might involve you and other committee members after the experiment (i.e no deals to split up afterward or no physical threats).

From time to time you will be asked to participate in opinion polls by a show of hands. You are free to answer in any manner you like. Please record the appropriate data on the voter record sheet.

Instructions to Candidates

If you win the election, you will be paid $10.00. If you lose, you will receive $1.00. Do not mention the amount of this payment and do not assume the payment to the other candidate is the same. Please do not talk to anyone aside from what is necessary to conduct polls and indicate your tentative point choices.

Election Organization

The election will be held _____ minutes after the instructions are completed. At the end of this period each candidate will choose a final point on the blackboard. The election will be held. Your payment will be determined by the final point chosen by the candidate who receives a majority vote.

Each candidate must maintain a tentative point choice during the election period. Both candidates will begin at the point (200, 150). A candidate is free to change this tentative choice at any time during the election period and as many times as he/she wishes.

Two types of polls will be conducted -- opinion polls and Gallup polls. Candidates will have the opportunity to ask "Would you prefer me to move to the point (____, ____)?" The opportunity to conduct such opinion polls will occur in turn with the first decided by lot. Every _____ minutes a Gallup poll will be conducted. The experimenter will ask, "If the election were held now, would you vote for S or T?" The results of all polls will be made public.

At the end of the election period each candidate must submit a final point. He will submit it in writing prior to learning about his opponent's choice. The candidates will then announce their final points and the election will be held.

The candidate who receives a majority vote wins the election. Voters' payments are determined by the final point chosen by the winning candidate. Are there any questions?

Prior to beginning, we would like all voters to answer the questions on the attached voter test sheet (p. 7).

VOTER BALLOT

Voter No. _____.

I wish to vote for candidate _____.

INSTRUCTIONS FOR THREE-CANDIDATE ELECTIONS

General

You are about to participate in an electoral process experiment in which one of three candidates (S, T, or U) will be elected. The purpose of the experiment is to gain insight into certain features of complex political processes. The instructions are simple. If you follow them carefully and make good decisions, you might earn a considerable amount of money. You will be paid in cash.

Instructions to Voters

Your task is to elect one of candidate S, candidate T, or candidate U. The task of the elected individual is to choose one of several competing alternatives, represented by points on the blackboard. After the election he/she will choose one and only one point. Your payoff depends on the particular point chosen by the elected individual (see attached payment chart). For example, suppose your payment chart is that given in figure 1, and that the elected individual's choice is the point (x, y) = (170, 50).

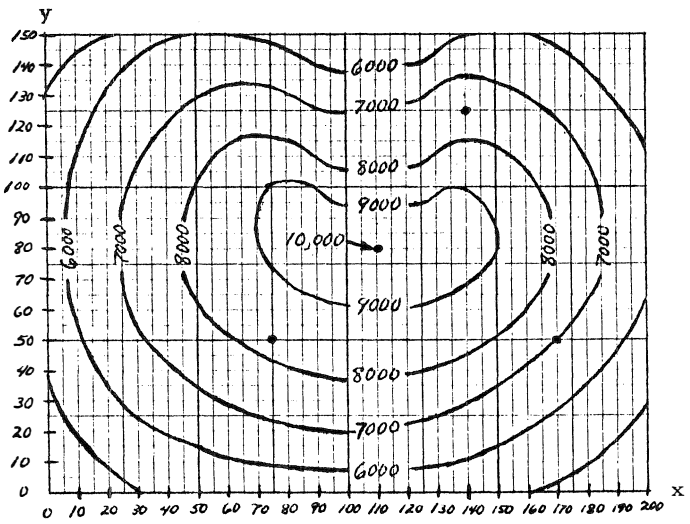


Figure 1

Your payment as read from figure 1 would be $7,000.

For points which lie between curves, the chart should be read in the following manner. Suppose the elected individual chooses the point **(140, 125). This point, (140, 125), is half way between** the curve marked $7,000 and the curve marked $8,000. So your payment is half way between $7,000 and $8,000, i.e. $7,500. If the point is one quarter of the distance between two curves, then your payment is determined by the same proportion. As an example (75, 50) lies one-fourth of the way between the curve marked $8,000 and the curve marked $9,000, so you get $8,250.

The payment charts may differ among individuals. This means that the patterns of preferences differ and the monetary amounts may not be comparable. The point which would result in the highest payment to you may not result in the highest payment to someone else. You should decide what final decision you want and do whatever you wish within the confines of the rules to get things to go your way. The experimenters, however, are not primarily concerned with whether or how you participate so long as you stay within the confines of the rules. Under no circumstances may you mention anything quantitative about your payment. You are free, if you wish, to indicate which point you like best, the ones you like least, the direction of your preference, etc. but you cannot mention anything about the actual monetary amounts. Under no circumstances may you mention anything about activities which might involve you and other committee members after the experiment (i.e., no deals to split up afterward or no physical threats).

From time to time you will be asked to participate in opinion polls by a show of hands. You are free to answer in any manner you like. Please record the appropriate data on the voter record sheet.

Instructions to Candidates

If you win the election, you will be paid $10.00. If you lose, you will receive $1.00. Do not mention the amount of this payment and do not assume the payment to the other candidates are the same. Please do not talk to anyone aside from what is necessary to conduct polls and indicate your tentative point choices.

Election Organization

The election will be held _____ minutes after the instructions are completed. At the end of this period each candidate will choose a final point on the blackboard. The election will be held. Your payment will be determined by the final point chosen by the candidate who receives a majority vote.

Each candidate must maintain a tentative point choice during the election period. All candidates will begin at the point (200, 150). A candidate is free to change this tentative choice at any time during the election period and as many times as he/she wishes.

Two types of polls will be conducted -- opinion polls and Gallup polls. Candidates will have the opportunity to ask "Would you prefer me to move to the point (____, ____)?" The opportunity to conduct such opinion polls will occur in turn with the first decided by lot. Every _____ minutes a Gallup poll will be conducted. The experimenter will ask, "If the election were held now, would you vote for S, T, or U?" The results of all polls will be made public.

At the end of the election period each candidate must submit a final point. He will submit it in writing prior to learning about his opponents' choices. The candidates will then announce their final points and the election will be held.

The candidate who receives the largest number of votes wins the election. Voters' payments are determined by the final point chosen by the winning candidate. Are there any questions?

Prior to beginning, we would like all voters to answer the questions on the attached voter test sheet (p. 9).

VOTER BALLOT

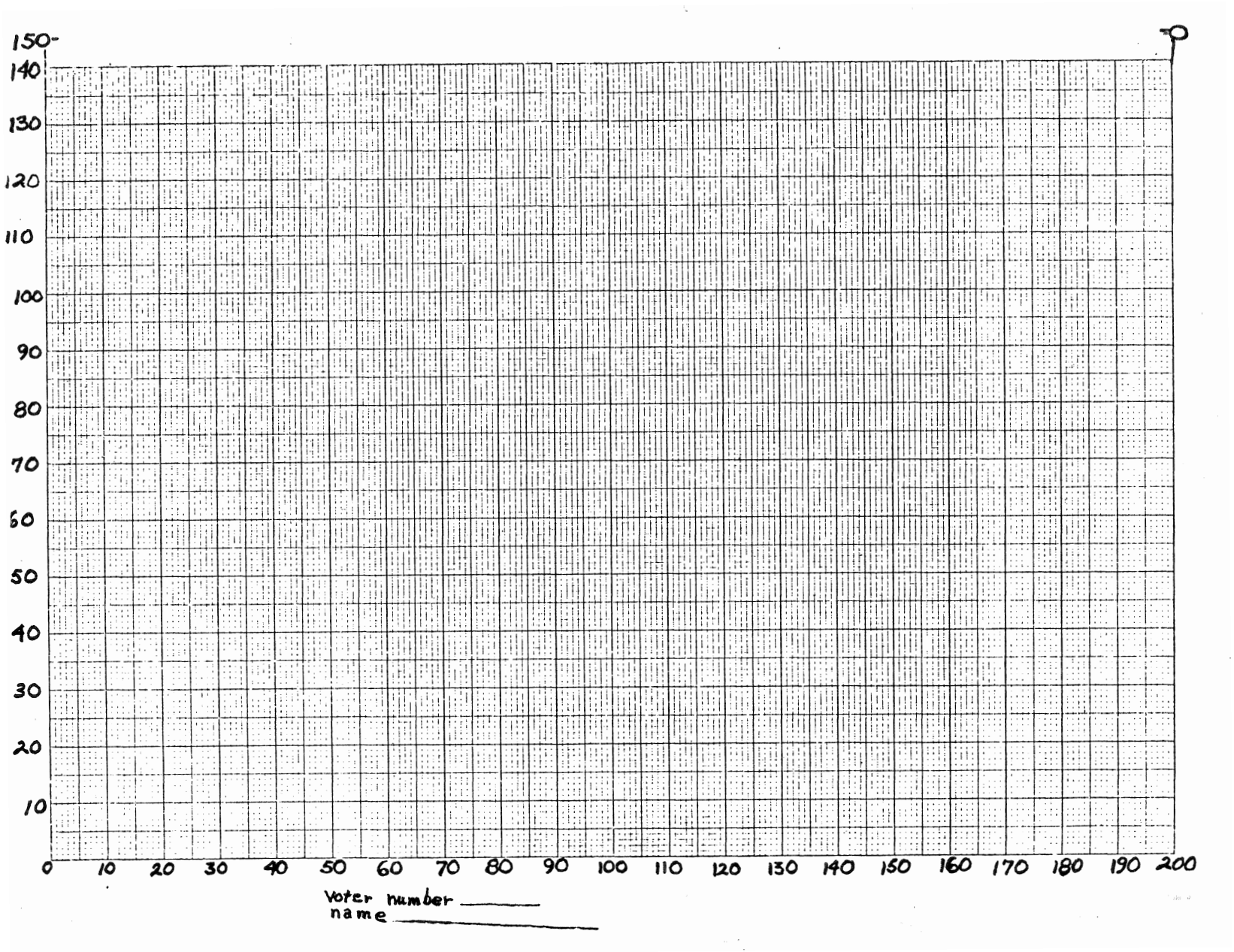
Voter No. _____.

I wish to vote for candidate _____.

Voter No._____

VOTER RECORD SHEET

Candidate/Poll	Tentative point	Proposed point	My Vote	Candidate/Poll	Tentative point	Proposed point	My Vote


150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Voter number
name

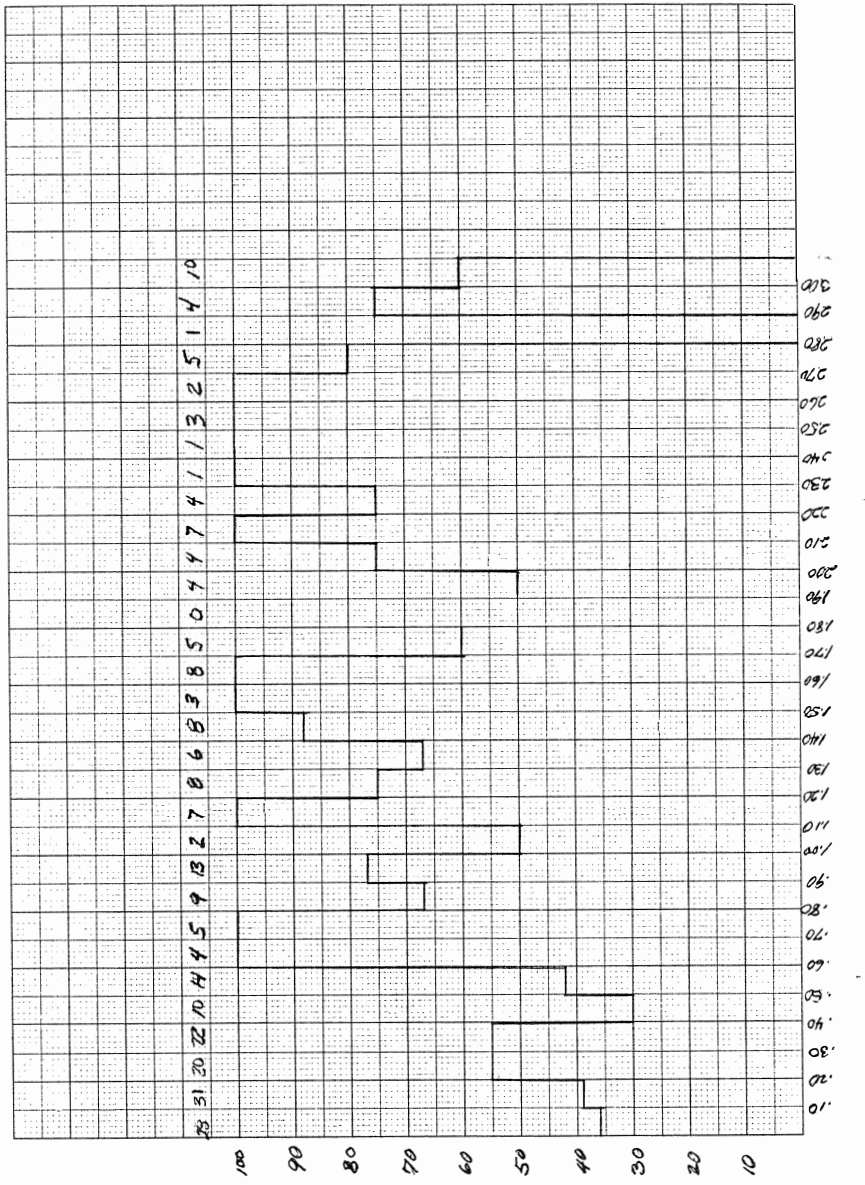
Voter Number_____

VOTER TEST QUESTIONS

1. If the final platform of the winning candidate is (90, 105) my payment would be $_____.

2. The point where I receive the most money is (,) which yields a payment of $_____.

3. Suppose the final point choice S is (50, 55), the final point choice of T is (85, 60), and the final choice of U is (120, 110); then the election of candidate _____ would yield me the most money. The amount would be $_____.



FOOTNOTES

* The financial support of the National Science Foundation and the Caltech Program for Enterprise and Public Policy is gratefully acknowledged. The Guggenheim Foundation and the Center for Advanced Study in the Behavioral Sciences also provided time and the research assistance of Lynn Gale and Ron Rice.

1. For a discussion of this see Fiorina and Plott (1978).

2. The null hypothesis that the outcome is the mean of the individual maximums or that the outcomes are uniformly distributed over the range of preferences can easily be rejected in favor of the alternative that the outcome is the core/equilibrium. In fact, the null hypothesis that the outcomes are the core/equilibrium cannot be rejected at a 10 percent level of confidence.

   The Hotelling T^2 tests are as follows:

	$\bar{\mu}$ - (40,70)	T^2	F	ρ	df
Committees	(-1.7,-.2)	5.8295	2.5909	.136	(2,8)
2 candidate	(-1.2,.9)	3.7303	1.6579	.250	(2,8)
3 candidate	(-.8,.5)	.6640	.2951	.752	(2,8)

3. A Box test for equality of variance-covariance yields the following results.

	df	χ^2	ρ
Committees vs 2 candidates	3	5.3705	.15
Committees vs 3 candidates	3	16.9675	$\rho < .001$
2 candidates vs 3 candidates	3	17.737	$\rho < .001$

4. Prior to the vote count, subjects were told that we needed those data resulting from their decision, and in fact there would be no tax. Subjects then voted and the winner was determined.

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